

bel canto  
e.One<sup>TM</sup> series

DAC 3.5VB MKII



USER'S GUIDE

# DAC3.5VB MKII

Upsampling Audio DAC  
with Master Reference Ultra-Clock™

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# Important Safety Instructions

Explanation of symbols used in this manual or on the rear/underside of the apparatus:



The Lightning Flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product enclosure that may be of sufficient magnitude to constitute a risk of shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

**TO COMPLETELY DISCONNECT THIS APPARATUS FROM THE AC MAINS, DISCONNECT THE POWER SUPPLY CORD PLUG FROM THE AC RECEPTACLE.**

**THE MAINS PLUG OF THE POWER SUPPLY CORD SHALL REMAIN READILY ACCESSIBLE.**

Disconnect supply cord before changing fuse. Refer servicing to qualified service personnel.

**WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE AND OBJECTS FILLED WITH LIQUIDS, SUCH AS VASES, SHOULD NOT BE PLACED ON THIS APPARATUS.**

- Read, keep and follow these instructions.
- Heed all warnings.
- Do not use the apparatus near water, ie near a bathtub, kitchen sink, laundry tub, in a wet basement, near a swimming pool etc.
- Clean only with dry cloth.
- Do not block any ventilation openings. Install in accordance with the Manufacturer's instructions. Site the apparatus so that its location or position does not interfere with its proper ventilation. For example, the apparatus should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings, or placed in a built in installation such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus that produce heat.
- Do not defeat the safety purpose of the polarized or grounding type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet; consult an electrician for replacement of the obsolete outlet.

- Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and at the point where they exit from the apparatus.
- Unplug this apparatus during lightning storms or when unused for long periods of time.
- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug has been damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
- Mains plug: Use the mains plug to disconnect the apparatus from the mains supply. The mains plug must be accessible at all times. Use the mains switch (if applicable) when the apparatus is not in use.
- Objects and liquid entry: Do not let objects or liquids fall into the apparatus. Do not expose the apparatus to dripping or splashing. Do not place a vessel containing liquid on top of the apparatus.
- No naked flame sources, such as lighted candles, should be placed on the apparatus.
- The apparatus has been designed for use in moderate and tropical climates

# In The U.K.

## Fuse replacement:

This appliance is fitted with a non-rewireable 10 amp mains plug. The plug contains a 10 amp fuse. If the fuse has blown it can be replaced as follows:

- Pull out the black fuse cover/carrier.
- Remove and dispose of the blown fuse.
- Fit a new 10 amp BS1362 approved fuse into the carrier and push the carrier back into the plug.

Always ensure the fuse cover is fitted. If the fuse cover is missing do not use the plug. Contact your Bel Canto retailer to obtain a replacement fuse cover. Fuses are for fire protection and do not protect against electric shock.



**WARNING: THIS APPLIANCE MUST BE GROUNDED.**

## FCC NOTICE

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does

cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## Green By Design

All Bel Canto products make use of compact and efficient design principles. Our products use less resources per unit to produce better performance than ever before. Everything from reduced packaging volume, to less weight in transport helps to reduce the overall environmental impact of bringing our products into the market.

Our products make very efficient use of electricity. Low energy usage and compact size ensure that the physical and environmental footprints of all Bel Canto products are minimized. Quality and performance play into this approach as all of our products are designed to remain vital and valid performers for many years. Should you want to upgrade to one of our new products, we even offer trade-in value for your old Bel Canto product to ensure that it is recycled in the most efficient and responsible manner.

## RoHS and WEEE

All of our current products are designed and produced to RoHS standards, ensuring that dangerous materials do not enter the waste stream. Lead free electronics assemblies and environmentally safe finishing and production methods are utilized to ensure that our products and processes are environmentally safe.

## Bel Canto Recycles

Bel Canto has always been a forward thinking company. In the same way that we are focused on the development of high-end audio products, we are also conscious of what we leave behind. For many years we have implemented environmentally sound measures to make the most efficient use of resources and keep our impact at a minimum.

We reuse or recycle more than 99% of the packing materials for our incoming parts shipments. Each year we divert massive amounts of cardboard, paper, plastic film, and Styrofoam from landfills. Our plastic and Styrofoam is delivered directly to local facilities that process it on site for use in their manufacturing. Steel, aluminum, and other metal waste products are delivered to local metal scrap yards for recycling back into the production stream.

We also participate in Waste Management's e-Cycling program. All electronic waste is processed in the US, with hazardous material being separated from non-hazardous, at ISO 9001 and ISO 14001 certified regional processing centers.

Our commitment to responsible production processes ensures that the absolute minimum of material used in the making of our products enters the waste stream.

# Warranty Information

Bel Canto products are automatically covered by a 90 day factory warranty that covers all internal parts and labor. Register online ([http://www.belcantodesign.com/Belcanto\\_Warranty.html](http://www.belcantodesign.com/Belcanto_Warranty.html)) within 30 days of purchase from an authorized dealer to automatically extend your warranty for 2 years starting from the date of purchase. If you do not have web access, please contact your dealer for assistance. Upon fully completing registration, within 5 business days you will receive an email that officially validates your warranty. Your information will be used for internal use only and will not be sold or released outside Bel Canto. Your comments and suggestions are appreciated and help us continually improve our products and services.

The warranty is only valid to the original owner and is non-transferable. Damage caused by unauthorized modification, abuse, or neglect of product will void your warranty. Any cost associated with return of product is the sole responsibility of the owner. All returns require a return authorization number issued after completing the RMA form in the support section of our website. If you have any questions, please feel free to contact us online at [info@belcantodesign.com](mailto:info@belcantodesign.com).

## Unpacking Your DAC 3.5VB MKII

DAC3.5VB MKII packaging contains the following:

- 1 (one) – DAC3.5VB MKII
- 1 (one) – DAC3.5VB MKII User's Guide
- 1 (one) – VB Interconnect Power Cable
- 1 (one) – Remote Control

Carefully unpack each piece and check for shipping damage. If there is any damage, or if anything is missing, please contact your dealer, distributor or Bel Canto Design.

**IMPORTANT:** Save all packing materials as they are specially designed to protect the unit during transportation or shipping. If the packing becomes lost or damaged, please contact your dealer, distributor or Bel Canto before attempting to transport your unit.

## Power Connection

The power supply on the DAC3.5VB MKII is preset for the proper power voltage and must be used with the Bel Canto VBS1 or LNS1 power supplies. The power cable should have the correct plug for your local power system. If you believe this to not be true, please contact your dealer immediately.

This product, like any electrical component, can be dangerous and cause injury unless correct handling procedures are observed and used. Before powering this product, it is necessary to read and follow proper setup and procedures.



### **WARNING!**

Do not connect power  
to this product yet!

# Setup & Placement

Because the DAC3.5VB MKII runs cool, it can be placed in many system locations without compromise. We do not recommend placing weights or other objects directly on the DAC3.5VB MKII. This may scratch or mar the chassis finish. Do not use harsh chemicals when cleaning the outside of your DAC3.5VB MKII.

Single Ended RCA and Balanced XLR connectors are available. XLR jacks allow balanced hookup using the standard North American pin configuration:

Pin 1 Ground  
Pin 2 Signal +  
Pin 3 Signal -



## IMPORTANT!

Make all connections before powering your unit!

# Design Features

- Master Reference Ultra-Clock with high rate jitter filter ensures maximum dynamic range from any source.
- 110dB dynamic range 24/192 ADC input for your analog sources
- 8 Digit Alphanumeric Green LED Display
- Internal VB supply with LC filter and >400,000uF of capacitance
- Uses the VBS1 or LNS1, Custom Ultra-Low noise switching supply for isolated analog power
- Critical analog supply filters using new Solid Polymer technology capacitors
- 5.5Vrms balanced output level to drive any amplifier

The DAC3.5VB MKII musical performance rests on the solid foundation of the Master Reference Ultra-Clock™. The Master Reference Ultra-Clock™ provides jitter performance 50x better than other clocks. Specifications of 2 picoseconds RMS and frequency accuracy of 0.0001% insure maximum dynamic range. The Master reference Ultra-Clock circuit uses a new aggressive 2Hz jitter filter, insuring that any incoming jitter on the data inputs can not compromise the final analog output signal quality.

The DAC3.5VB MKII has been optimized to provide the highest level of performance for all of these critical functions. It provides digital preamplifier as well as D/A conversion and bridge from traditional CD or DVD player sources and from a USB LightLink input for computer music playback sources.

All digital input sources experience 2 jitter rejection stages, one analog PLL stage at the SPDIF input and a second 2Hz digital PLL stage that rolls off incoming jitter by more than 10X at 10Hz frequencies and greater than 10,000X by 100 Hz. Any incoming jitter at frequencies above 10Hz is reduced to levels that have no effect on measured or sonic performance. The combination of the VBS1, internal VB stage and the new jitter filtration provide an extremely well isolated environment for the DAC3.5VB MKII Digital to Analog stage. The final conversion to analog is no longer subject to external noise and interference sources and the resulting purity and dynamic quality is uniquely musical and compelling. See page 9 for back panel.

The High Dynamic Range analog input section provides 110dB of dynamic range for any of your analog sources-it can be connected to a PHONO3 preamplifier for a complete system including a turntable source, or it can be configured as a Home Theater Bypass to integrate into a complete high performance system offering the best performance for your 2-channel sources.

The dual-differential multi-bit delta-sigma DAC circuit achieves remarkable analog performance. The 5.5VRMS true balanced XLR outputs provide 126dB of dynamic range. The noise floor of this DAC/processor is so low and so clean that the DAC3.5VB MKII is optimally used as a complete DAC/Preamplifier with a digital level control. Because of dither applied to the 24bit word there is no loss of effective resolution. The application of optimized dither insures that the analog output noise floor maintains a clean sound, devoid of any tones or artifacts. The DAC3.5VB MKII can provide an optimum solution with the addition of a Bel Canto e.One amplifier, eliminating the need for an analog preamplifier.

# Single Knob Control Functions & Display

## Front Panel Control Knob:

The control knob is a continuously rotating control with a push-switch function. Always push the button with your finger in the direct center of the knob. Pushing the knob will switch between selectable values on the display. Rotating the control left or right will adjust the selected value.



## Upon Power Up:

When switched on, the DAC3.5VB MKII will perform its startup sequence followed by displaying the firmware revision.



After 2 seconds, Input Selection Mode will become active. The AES input will be selected by default and Soft Mute will be active. The volume will be set to 50.0 even if the fixed/variable button is in Fixed mode. The selected input is on the left of the display and the volume is on the right. The volume level will automatically ramp down and up during this selection process



## Input Selection Mode:

Briefly press the control knob and the input on the left of the display will be highlighted. Rotate the control knob to scroll to the desired input. Inputs are indicated as: AES, SP1 (SPDIF1), SP2 (SPDIF2), OPT (TOSLINK), ST (High Speed ST Fiber) and ANLG (Analog Input).

## Variable Output Mode:

The DAC3.5VB MKII Variable Output operating mode, selected from the rear panel Fixed/Variable output switch, allows you to change volume level by rotating the knob or via the supplied remote control.

To adjust the volume, rotate the knob until the volume number on the right of the display is highlighted.

The volume down function (counter-clockwise rotation) is very rapid and allows quick changes in the volume level. Volume up (clockwise rotation) functions rapidly up to a displayed volume level of 65.0. Volume is adjustable from 0.0 to 100.0 by increments of 0.5.

## Fixed Output Operating Mode:

Pressing the rear panel Fixed/Variable Output switch to the in position will set the DAC3.5VB MKII in a fixed output operating mode. This mode is used when driving an analog preamp or integrated amplifier input. The volume control function is then provided by the associated preamplifier or integrated amplifier.

To use the Fixed Ouput mode set the ouput level to 100.0 for a 2.75Vrms maximum level from the RCA outputs or 5.5Vrms level for the Balanced XLR outputs. If you want the outputs set for a lower level then set the volume control to a lower level. For example, for about 2 Vrms out from the balanced outputs set the volume control to 91.0. This will represent about a 2 Vrms output level on the balanced outputs. When the level is set then press the rear panel Fixed/Variable Output button. The front panel display will now show the selected input. Rotating the knob will scroll to different inputs and the Volume and Mute functions on the remote will not function.

## Front Panel Digital Lock Indicator:

When no digital input signal is present on an input, LOS (Loss Of Signal) will appear on the display. If this occurs you need to check that the correct input is selected and then check that the digital source is connected, active and functioning correctly.

# Remote Control

The DAC3.5VB MKII Remote Control has a comprehensive set of control features that are not available on the front panel, including expanded programmability.

To access all DAC3.5VB MKII control features press the button marked DAC towards the bottom of the remote control. (The Main CD controls will still operate in the DAC, PRE and Tuner modes.)

**PGM:** Enter program mode. Here you can assign a four character name to each input, turn each input ON or OFF, and/or activate Home Theater Bypass for the Analog Input.



Use the four directional keys at the top of the remote to navigate programming options. Make your selection by pressing the ENTER key.



After selecting YES when entering program mode, you can name any or all inputs. Use the LEFT or RIGHT arrow to select the input to name. Hit ENTER. Use the right key to select one of four characters to modify. You can quickly scroll through the characters (A-Z, 0-9, or blank) using the UP and DOWN arrows. After finishing naming the selected input, press ENTER.



Before or after naming an input, you can turn an input ON or OFF by using the UP and DOWN buttons to select ON or OFF and then hitting ENTER.



When on the ANALOG input, you can also choose Home Theatre Bypass (HTB). In this mode, the analog input simply passes signal through with a fixed output level. Note that this disables the volume control and requires that the volume control on the Home Theater processor be used. **Use this feature only with a volume controlled line level source. Using this with the fixed output of a CD player, for example, could result in damage to the amplifier or loudspeaker!**



When you wish to exit Program mode, simply hit the PGM button. You will then be prompted to save your changes. Toggle between YES and NO and then hit ENTER.



To restore Factory Default settings: Hold in the Control Knob while powering up the DAC3.5VB MKII, and continue to hold until the display finishes its startup sequence.

**VOL+:** Increases the volume setting in Variable Output mode. This will Punch Through to any Bel Canto unit in Variable Output mode. The display will show the volume level while changing.

**VOL-:** Decreases the volume setting in Variable Output mode. This will Punch Through to any Bel Canto unit in Variable Output mode. The display will show the volume level while changing.

**CH/SCAN+:** Toggles the input selection up in number and wrap around. Note that the first press of this control will show the active input selection.

**CH/SCAN-:** Toggles the input selection down in number and wrap around. Note that the first press of this control will show the active input selection.

# Remote Control

**Display:** Toggles through several display options:

1. Standard: displays selected Input on the left and Volume on the right.
2. Sample Rate: displays selected sample rate. Regardless of the display mode you are in, this display will appear whenever your source changes sample rate:



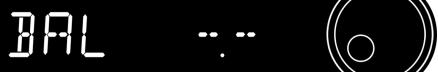
3. Product Name
4. Software Version *see page 6 for image*
5. Display Off. Using the remote or using the control knob will turn the display back on for 3 seconds.

**Mute:** When in variable output mode this will switch the analog outputs from Soft to Hard Mute and Unmuted modes. Soft Mute is indicated by the word SOFT overwritten on the volume level display. Hard mute over-writes the level display with MUTE. The Mute function will Punch Through to any Bel Canto unit set in Variable Output mode.

**Number Buttons:** Use for direct input selection.

- 1: AES
- 2: SPDIF1
- 3: SPDIF2
- 4: TOSLINK
- 5: High Speed ST Fiber
- 6: Analog Input

**Bal L / Bal R:** Shift the balance up to 6.0 dB towards either channel in increments of 0.5 dB. If the balance is activated, a carrot will appear on the display. It will point towards the direction in which the balance is shifted



**Phase:** Invert the phase. If enabled, you will see a dash to the left of the volume.

SP I - 65.0

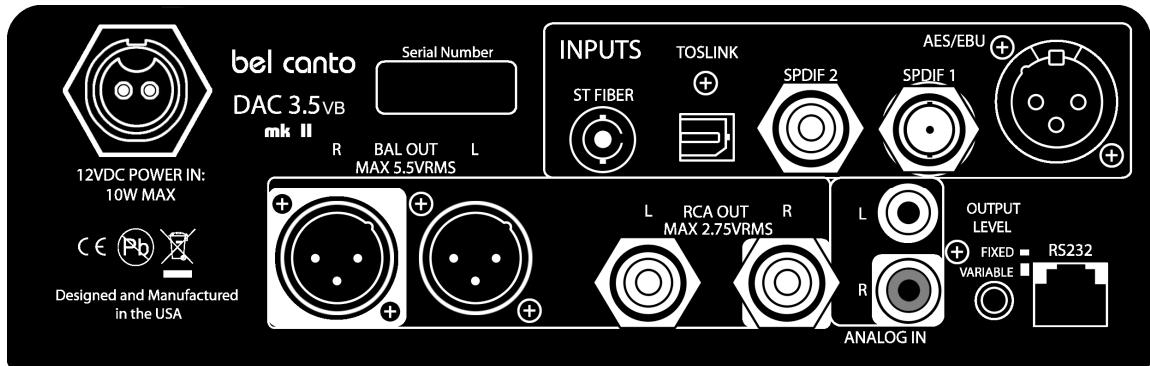


When both Balance and Phase shift are in effect, you will see this:

SP I < 65.0



# Rear Panel Connections



**IMPORTANT:** When using the DAC3.5VB MKII directly into a power amplifier, ensure that the Fixed/Variable Output button is in the OUT (variable) position. Operation in Fixed Mode directly into the amplifier could cause extreme output levels, clipping and damage to the loudspeakers, amplifiers or your ears!

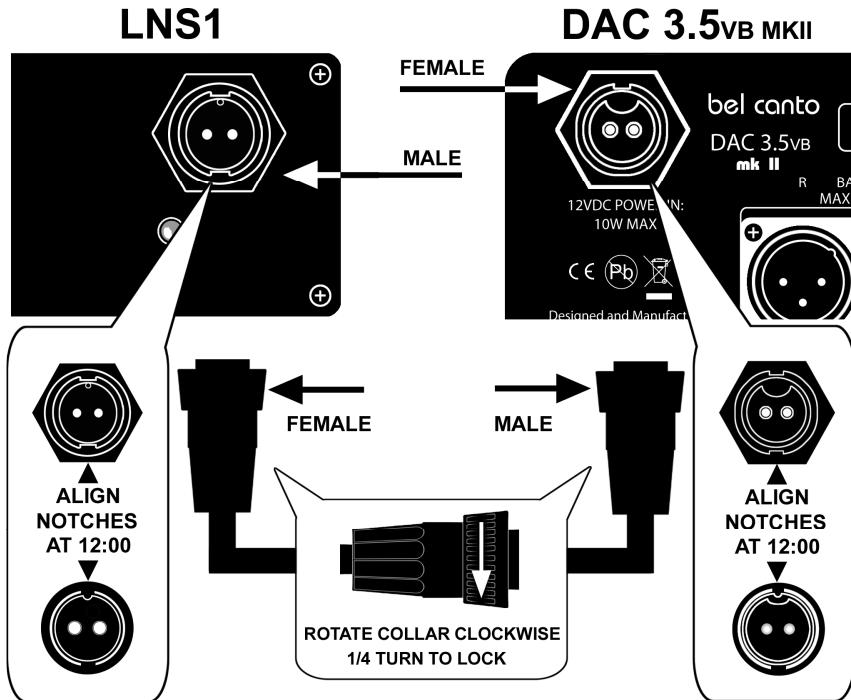
- 12VDC VB power interconnect jack to interface with either the VBS1 or LNS1 power supplies
- ST Fiber Input operates up to 24/192 data rate
- TOSLINK input accept any standard plastic or glass fiber optical TOSLINK cable and operates up to 24/192 data rate
- SPDIF1 and SPDIF2 accept BNC or RCA connections from any 75 ohm SPDIF source and operate to at least 24/192 data rate
- AES/EBU Input accepts any AES/EBU standard 110 ohm digital source and operates up to 24/192 data rate
- XLR 5.5Vrms or 7. RCA 2.75Vrms outputs are used for directly driving a power amplifier in variable output mode or a preamplifier input when in fixed output mode.
- RCA Analog Inputs
- Output Level Button selects Fixed or Variable Output Mode
- RS232 Connection

When all connections to and from the unit have been made then double check everything before plugging the DAC3.5VB MKII into the power source.

## CONDITIONING

The sonic performance of the DAC3.5VB MKII will begin to stabilize after 100 hours of continuous power up.

# Connecting The LNS1



- The DAC3.5VB MKII must be powered by either the VBS1 or the LNS1. If using the VBS1, please refer to the VBS1 User's Guide for connectivity. If using the LNS1, please read the following
- The LNS1 is designed to power Bel Canto VB equipped products only. Use of any cable other than the supplied power interconnect may damage either the LNS1 or VB equipped unit and will void any warranty. Certain non-VB equipped units can be factory upgraded. To begin the upgrade process, fill out the RMA form in the Support Section of our website
- When connecting your VB unit to the LNS1, be careful to observe the alignment notches on both units power receptacles and the power interconnect cable
- When inserting the power interconnect cable, align the notch on the cable end and the alignment teeth on the outer sleeve to the 12 o'clock position. This will allow the interconnect cable to fully seat and ensure that the plug mates correctly with the power receptacle
- Once the power interconnect cable is fully seated in the receptacle, lock in the power interconnect cable by turning the outer sleeve clockwise one quarter turn. Proper seating of the LNS1 cable will ensure safe and secure operation of the LNS1 and all connected components
- The LNS1 has been designed to run on non-regulated, non-filtered AC Mains. Usage of any additional isolation or filtration from the AC Mains supply may compromise LNS1 performance

# Tips For Operation

## Output Connections

We strongly recommend that you use the Balanced XLR output to drive your e.One amplifier. Because of the DC coupled nature of the DAC3.5VB MKII there is a small residual DC offset on the outputs. This is typically less than 10mV (0.01 Volts) and will not be a problem for any Bel Canto amplifier or any vacuum tube or solid state amplifier with AC coupling or DC servo control. There is no problem connecting the DAC3.5VB MKII to any preamplifier. If using a Bel Canto preamp there will be no small click or pop when selecting the input. Other preamplifiers that do not ramp the volume up or down may produce a small click when selecting the DAC3.5VB MKII input.

## Power Up

We recommend leaving the DAC3.5VB MKII powered at all times as the sonic quality is best after several hundred hours of play and 48-72 hours of power on after the initial break-in time.

## Connection to a Computer

For connections up to 24/96, use the USB out of your computer to connect into the DAC3.5VB MKII via either the USB Link 24/96 or the USB Light Link 24/96. For more details on optimizing computer audio sources please refer to our on-line guide at: [www.belcantodesign.com](http://www.belcantodesign.com)

## What to do if there is hum or ground noise

The design of the DAC3.5VB MKII greatly reduces the chance for ground loop induced hum and noise. We recommend using the balanced outputs for best performance. The balanced outputs can drive long lines to 10 meter length.

Connect all power cables of the audio system to a common outlet box. Having the audio system components share a common ground will greatly reduce the possibility for ground current noise being introduced into the audio signal path.

## Volume Control Punch Through

The Volume Up, Down and Mute functions on the remote control will affect any Bel Canto unit in Variable Output mode regardless of whether PRE, DAC, CD or TUNER is selected. It is recommended that only the device with volume control closest to the power amps be in Variable Output mode. Any other devices that are capable of volume control should be in Fixed Volume mode.

# Specifications

## Digital Section:

Maximum Input Data Rate:	
24bit Data at 192Ks/s:	AES 110ohm XLR, SPDIF 75ohm BNC/RCA, ST Fiber and TOSLINK
Master Clock jitter:	2picosecond RMS

## Analog 24/192 DAC Section:

Maximum Output:	5.5 Vrms balanced XLR, 2.5 Vrms RCA
Output Impedance:	200 ohms balanced XLR, 100 ohms RCA
Frequency Response:	20 Hz-20 KHz, +/- 0.5dB
THD+N:	< 0.0015%, 5.5Vrms balanced out, 1KHz
Output Noise:	< 3uVrms A-weighted 20Hz-20KHz
Dynamic Range:	126dB A-weighted 20Hz-20KHz

## Analog 24/192 ADC Section:

Maximum Input:	2.5 Vrms RCA
Input Impedance:	12K ohms RCA
Frequency Response:	20 Hz-20KHz, +/- 0.5dB
THD+N:	0.003%, 2.5Vrms in, 1KHz
Dynamic Range:	110dB, A-weighted 20Hz-20KHz

## General:

Power Usage On:	9W
Power Usage Off:	0.0W
Power Requirement:	12VDC 0.75A

## Dimensions :

8.5" W x 12.5" D x 3.5" H (216 mm x 318 mm x 88 mm)

## Weight:

14lbs. (6.5 kg)

*Features and specifications are subject to improvements and changes without prior notice.*

# Declaration Of Conformity

**Application of Council Directive(s):**

2004/108/EC and 2006/95/EC, as amended

**Standard(s) to Which Conformity Is Declared:**

EN 55013:2001 + A1:2003 + A2:2006

EN 5520:2007

EN 61000-3-2:2006

EN 61000-3-3:1995 + A1:2001 + A2:2005

EN 60065:2002/A12:2011

**Manufacturer:**

Bel Canto Design, Ltd.

221 1<sup>st</sup> Street North

Minneapolis, MN 55401 USA

The equipment identified here conforms to the Directive(s) and Standard(s) specified above.

**Type of Equipment:** Digital to Analog Converter

**Models:** DAC3.5VB MKII

**Date:** January, 2012

**Bel Canto Design, Ltd.**

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